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## ANALYSIS OF CONSCIOUSNESS UNDER NEGATIVE INSTRUCTION<sup>1</sup>

By L. R. GEISSLER

In connection with reaction-experiments on association and reproduction with normal<sup>2</sup> and abnormal<sup>3</sup> subjects, H. S. Langfeld has recently employed and studied that kind of negative instruction which requires the suppression of the name of a perceived object. The problem of the negative instruction and its relation to recent investigations of the conscious attitudes, the thought-processes, and other similar topics, seemed to us of such importance as to deserve a special and more detailed study for its own sake. Our aim was, therefore, first to repeat Langfeld's experiments with greater emphasis on detailed introspections, and then to introduce such variations of conditions as might be expected to throw further light on the analysis of consciousness under negative instruction and in particular on the nature of the suppression.

The experiments were performed in the Psychological Laboratory of Cornell University during the summer session of 1911, by Mr. F. G. Tappan,<sup>4</sup> instructor in Electrical Engineering and candidate for the degree of Ph. D. The repetition of Langfeld's experiments was made as nearly identical with the original as possible; the only appreciable difference was that we worked in daylight and had an electric fan-motor running whose faint but constant noise veiled any unavoidable distractions. Among our four observers was Miss L. M. Day, a graduate student in psychology, who had attained a high degree of practice in the experiments on Meaning conducted by Dr. Jacobson,<sup>5</sup> in the previous year. Another

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<sup>1</sup> From the Psychological Laboratory of Cornell University.

<sup>2</sup> Suppression with Negative Instruction. *Psychol. Bull.*, VII, 1910, 200-208.

<sup>3</sup> Suppression with Negative Instruction. *Psychol. Rev.*, XVIII, 1911, 411-424.

<sup>4</sup> The writer gladly takes this opportunity to thank Mr. Tappan for his skill and patience in carrying out the work, his care and pains in calculating and summarising the quantitative results, and his general interest in the progress of the investigation.

<sup>5</sup> On Meaning and Understanding. *Amer. Jour. Psychol.*, XXII, 1911, 553-557.

highly practised observer was the present writer, who likewise had taken part in these experiments and who besides had several years' experience in introspective work. The two remaining observers were students of the Summer School, Miss E. Forchheimer, instructor in the department of Education at the Normal College of the City of New York, and Mr. N. M. Sharpe, a senior in Cornell University, who had attended several lecture and laboratory courses in the department of psychology. These four observers had, then, various degrees of practice in introspection; they will be referred to, although in a different order, under the letters A, B, C, and D.

The exact conditions of our first series of experiments were as follows. The observer sat before a large, black, wooden screen behind which in a rectangular opening a picture could be exposed by moving a small cardboard screen, usually covering the opening, quickly and noiselessly upwards. All other surroundings, including the experimenter himself, were hidden from the observer's sight by black curtains. Before every exposure the experimenter read Langfeld's instruction in a calm, indifferent tone of voice. Then he said "Ready," waited a second, gave the signal "Now," and after another second raised the small screen and started the stopwatch. As soon as the observer began to give the associated reaction-word the stopwatch was stopped, and the screen dropped again. Shortly afterwards the observer dictated his introspection, in as detailed a manner as he was able, and if possible in the same temporal order in which the experiences occurred. No questions were asked, except in cases of obvious misunderstanding. As in Langfeld's work, the introspections extended mostly over the mid-period; that is, from the first perception of the picture up to the completed reaction. In a second series of experiments the introspections covered sometimes the fore-period and sometimes the after-period. The observer never knew beforehand what he would be expected to give, as we thought it more important to avoid any kind of change in the contents of consciousness due to such previous knowledge than to facilitate introspective analysis at the risk of varying the state of consciousness by predetermination. The fore-period began with the signal "Ready" and stopped at the first perception of the picture, while the after-period started with the first articulation of the reaction word. The other experimental conditions of this second series of observations were the same as those of the first series.

The principal change in our third group consisted in the substitution of actual objects for the pictures. For that purpose the black wooden screen was replaced by a black curtain behind which the object was placed. The observer's right elbow rested on the table so that the lower arm was also behind the curtain. At "Ready" the hand was raised, while the experimenter silently put the object in its place. At "Now" the hand moved quickly downward, and as soon as it came into contact with the object the stopwatch was set off, and stopped again with the beginning of the reaction. Twenty objects were presented on two successive days in the following order: tennis ball, electric dry cell, pack of loose cards, pocket-knife, electric bulb, scissors, tobacco pipe, teaspoon, comb, spool, watch, shoe-horn, ink-bottle, blackboard-eraser, glass, fountain-pen, cotton-wool, bunch of keys, alarm-clock, pencil. The instructions were modified correspondingly and the introspections extended over the total period from the "Ready" to the end. In the last series, finally, the instruction was reversed into its positive form, to read: "Do not react with any word except the name of the object." The following twenty objects were used: book, saucer, pencil, clamp, pliers, silver dollar, fork, compass, mucilage-tube, toy-pistol, apple, rubber-stamp, nail-file, screw-driver, ruler, marble, checker, cartridge, nail, pencil-eraser.

We may consider first a few quantitative results. The data from the first series agree very closely with those of Lang-

TABLE I. REACTION-TIMES

No. of Series	Obs.	No. of Expts.	Average	MV	Range	S. Ss. <sup>6</sup>
I.	A	67	1.75	± .40	.9-9.1	67
	B	81	1.60	± .45	.6-7.0	81
	C	67	1.75	± .45	.9-3.4	67
	D	67	1.40	± .40	.6-2.7	65
III.	A	20	2.25	± .65	1.1-4.0	19
	B	19	2.40	± .80	.6-4.2	19
	C	20	2.90	± .80	1.1-4.4	20
	D	19	2.90	± 1.50	1.0-9.0	19
IV.	A	23	2.90	± .70	.7-15.0	—
	B	20	3.50	± 1.85	1.1-12.7	—
	C	23	2.90	± 1.45	.7-9.0	—
	D	23	3.50	± 2.75	.9-17.0	—

<sup>6</sup> This column gives the total number of successful suppressions.

feld, indicating that the change to daylight conditions had no appreciable influence upon the results. The only noteworthy difference is that three of our observers had no, and the fourth only two, unsuccessful suppressions of the forbidden name of the object. Statistical tables on the frequency of certain kinds of imagery are of no significance for our particular purpose and are therefore omitted, especially as we have satisfied ourselves that they reveal nothing different from those given by Langfeld. The average reaction-time, its mean variation, and its range may be seen from Table I. The same table shows also the average reaction-time, mean variation and range for the experiments of the third and fourth series, in which objects were used. The numbers in the fourth, fifth, and sixth column are seconds.

It is natural that the touch-reactions should be relatively slow, on account of the delayed recognition of the objects by touch; but it is surprising to find the reactions with positive instruction slower than those with negative instruction. The only exception is observer C, whose times are identical in both series, although even here the fourth series shows a larger mean variation and range. The reason for this unexpected difference between the third and fourth series will become plain from the introspections. There is only one unsuccessful suppression in the third series, with A, who reacted to the object fountain-pen with the word pen. In none of our series does the reaction-time show any tendency to become shorter with practice; in fact, some of the maximal times occur toward the end of a series.

Turning now to the qualitative analysis of consciousness under an instruction, as revealed by our introspective records, we may most appropriately begin by a comparison of Langfeld's data with those obtained by us under nearly identical conditions. Langfeld finds "all forms of suppression from a fully voluntary act to a purely automatic reaction," and distinguishes in this development eight different groups or stages, adding, however, that "the different forms are scattered throughout the different days and the different subjects." He would probably not maintain that these groups or stages are the only ones, or that they are all of equal frequency or significance. Our own records verify most of his stages; but we can not find any parallel to his fourth group, in which the recollection of the negative instruction is sufficient to inhibit even the kinaesthetic image of the forbidden name. Some of his illustrations of this group seem to show, however, that the name of the object must have been present in conscious-

ness, if not as a kinaesthetic image, then in some other form. Consider, for example, the following introspection: *Cannon-Gun*. "Idea of cannon. Recalled that I was not to say cannon, so said gun." What is the "idea of cannon" in this case? In other examples, the term kinaesthetic image does not always seem to be used in the same way. In one case we read, for example, "kinaesthetic image of cards. Suppressed it, etc.," and in another case: *Horse-Cow*. "Kinaesthetic image of horse. As to the suppression, the word simply did not come, etc." Here the 'kinaesthetic image of horse' seems to be something different from the word horse, while in the case of the cards the pronoun 'it' refers to the image, and no word is mentioned. Similar cases occur on p. 207: *Teeth-Gum*. "Kinaesthetic image of false teeth. Should have said these words, etc." What, then, is this kinaesthetic image, and what is really suppressed? Langfeld does not describe the suppression itself; his conclusions refer mostly to its development only; how the suppression takes place is not stated. In this respect we believe that our repetitions and variations of Langfeld's experiments form a necessary supplement to his work. In order to give the reader a more concrete idea of the sort of consciousness involved in the reaction to a negative instruction, we have summarised the introspections of our four observers under each one of our various conditions, and have added in footnotes samples of introspections to illustrate points of special significance.

#### INTROSPECTIONS ON THE MAIN-PERIOD (REPETITION OF LANGFELD'S WORK)

##### *Observer A.*

The perception and recognition of the object usually arouse its name in internal speech. Sometimes there is a strong kinaesthetic tendency to say the name, which consists chiefly in actually initiated movements<sup>7</sup> of the tongue and lips.—In 8 cases the name of the object is not in consciousness.

The suppression following is sometimes attitudinal, containing kinaesthetic strains and pressure sensations in the palate, organic sensations and inhibited or irregular breathing, muscular rigidity of mouth and lips and general tension of the muscles involved in articulation (this occurred usually in focal clearness).<sup>8</sup> Sometimes the suppression is

<sup>7</sup> *Pipe—Tobacco*, 1.2 sec. "Kinaesthetic tendency to say pipe, with lips closed for 'p.' Then vague visual image of Mr. F., leading to verbal idea: 'tobacco—pipe' and said tobacco . . ."

<sup>8</sup> *Carriage—Wheel*, 1.5 sec. "Internal speech: 'carriage.' State of confusion, eyes moving over picture, mouth half open as if catching my breath, held breath, strong pressure in region of soft palate, tendency to pronounce carriage, at least ready for k-sound as the beginning of this word. . . ."

ideational, consisting mostly of verbal ideas fleeting through the focus of consciousness, as "I must not say so and so," or "What can I say?" or longer comments on possible reaction words, etc." In later experiments (of this group) the suppression is sometimes replaced by an attitude of hesitation which is analysed into organic sensations from the diaphragm-region, and muscular strains from frowning and vague staring at the picture. The whole attitude is unpleasant.<sup>10</sup>

This stage is sometimes followed by an active attitude of search, consisting of the resumption of strong eye-movements and many verbal ideas, mostly commenting critically on the difficulty of the situation, as "this is absurd," or the like.<sup>11</sup>

The actual articulation of the resulting reaction-word is sometimes anticipated either in internal speech or as a verbal idea. Sometimes, especially when there has been no suppression, the reaction takes place automatically either as the result of a common-place word association, such as table-chair, where table is the name of the pictured object, or as the name of that part of the picture which has been in the focus of both attention and vision.<sup>12</sup> The reaction may be accompanied or followed by feelings of relief, satisfaction, surprise, familiarity, etc. Occasionally verbal memories enter, or verbal ideas either criticising or justifying the reaction-word with reference to the instruction,<sup>13</sup> for example, "this word is all right," "perhaps I ought to have said so and so," etc.

#### *Observer B.*

Immediately upon the perception of the object its name arises verbally in auditory-kinaesthetic form. This is followed in the earlier experiments by "incipient" throat, tongue and lip movements, which later drop out while the auditory-kinaesthetic idea of the word remains.—In 15 of the 81 experiments no name of the object is present in consciousness.

Then a "muddled feeling" with inhibition or irregularity of breathing and slight organic nausea occur, while the eyes are rapidly working

<sup>9</sup> *Violin—Bow*, 1.9 sec. "First thing on sight of picture was 'violin' in pronounced internal speech. Then in verbal idea 'must not say that' and word 'bass' came, but immediately the verbal idea 'this may be a bass, oh what can I say?' Then period of waiting with strong organic sensations about diaphragm and abdominal wall, very unpleasant. Finally, with a feeling of relief, the verbal idea 'oh yes, bow is o. k.' and said bow."

<sup>10</sup> See end of previous introspection.

<sup>11</sup> *Wheelbarrow—Move*, 1.5 sec. "No name suggested itself. Word 'move' in internal speech was first word after period of search when eyes wandered over picture with occasional fixation, frowning, holding breath, uneasy and unpleasant. . . ."

<sup>12</sup> *Trolley car—House*, 1.1 sec. "Word 'house' was suggested in internal speech by long row of windows before I recognised the picture as a street-car. There was no suppression, only a slight hesitation with vague eye-movements and wrinkling of forehead, all slightly unpleasant. Then repeated 'house' as a reaction-word."

<sup>13</sup> *Pail—Water*, 1.3 sec. "Word 'bucket' in internal speech with tendency to say it and moved lips. Then verbal idea: 'inside of bucket' led at once to pronunciation 'water' with a sort of surprise to myself. Then a feeling of satisfaction, with a mental nod of agreement to it, meaning 'yes, that's all right,' all slightly pleasant."

over the picture.<sup>14</sup> The meaning of all this is: "must not say that word."<sup>15</sup> In later experiments a brief verbal remembrance of the instruction "you are not to name the object" takes its place, and finally itself disappears.

This is followed by a period of search for a reaction-word, consisting of strains in head, much internal speech and unpleasantness.<sup>16</sup> In later experiments the eyes begin to fixate habitually only a part of the picture, as the result of the positive part of the instruction, while the rest of the picture is barely noticed,<sup>17</sup> and the verbal idea of the name of the fixated part occurs with it in auditory-kinaesthetic form, anticipating the reaction.

The articulation of the reaction is often accompanied by a feeling of relief, and usually followed in internal speech by the justification: "this word is all right," implying a reference to the instruction. Toward the end of this series of experiments the habit of naming the accidentally fixated part is so strong that the whole reaction is automatic and just barely conscious. But in difficult situations the earlier conscious complexity returns.

#### *Observer C.*

The perception of the object arouses its name, mostly in internal speech, kinaesthetically. Frequently this is accompanied by clear visual imagery of similar objects, esp. those owned or recently experienced by the observer. At the same time many other visual and verbal memory-associations fill the background of consciousness.—In 15 cases no name of the pictured object occurred.

Then follows in some cases either an attitudinal suppression<sup>18</sup> whose main contents are muscular strains from "tightness of the throat" and "incipient" movements to say the forbidden name, or an ideational suppression in kinaesthetic-verbal ideas, as "must not say it" or a partial repetition of the instruction.<sup>19</sup>

<sup>14</sup> *Trumpet—Tube*, 2.2 sec. "Word 'trumpet' came right away in auditory-kinaesthetic terms. Decided throat-movements, incipient tongue and lip-movements, inhibited breathing, nausea, rapid working of eyes, all meaning 'must not say.' Looked around for something else, with strains in head, all this unpleasant. Word tube as auditory-kinaesthetic idea came with feeling of relief, mildly pleasant, and deeper breathing. Then said tube."

<sup>15</sup> See preceding introspection.

<sup>16</sup> *Fork—Handle*, 1.5 sec. "Word 'fork' came first in auditory-kinaesthetic idea. No tendency to say it aloud and no suppression. Eyes moved along picture, strains in head, organic complex rather unpleasant and meaning 'hunting for word.' Eyes then fixated handle and this word came to consciousness with feeling of relief."

<sup>17</sup> *Automobile—Wheel*, 0.6 sec. "Eyes fixated at once hind wheel and the word came in auditory-kinaesthetic idea and said it very automatically."

<sup>18</sup> *Corn-ear—Succotash*, 1.7 sec. "Had to suppress 'cob,' which kept ringing in my ears. Was conscious of a breeze in room, of strains in eyes, and of tightness in throat. Could not say anything else, had to grope around for word (Experimenter's note: O made an actual sound like 'ugh'). Then a visual image of white dish of succotash and said it."

<sup>19</sup> *Drum—Stick*, 1.1 sec. "Word drum came in internal speech, then verbal idea 'must not say that.' Fixated the drum-stick and said 'stick' with feeling of satisfaction that instruction was followed."



Sometimes a period of waiting, suspension and search follows, which is not further analysed, but is usually marked by strong unpleasantness.

The reaction is usually the result of fixating and naming in anticipatory internal speech some prominent or peculiar part of the picture or of a visual image of great vividness.<sup>20</sup> The reaction is followed by a vaguely pleasant attitude or feeling of satisfaction and by verbal and visual memory-associations.

#### *Observer D.*

The perception and recognition are accompanied or followed by the name of the object, occurring either in internal speech or as a kinaesthetic "tendency" in the form of initiated lip and tongue movements.<sup>21</sup>—In 5 cases no name of the object occurred.

Then, in a few cases only, a kinaesthetic attitude of suppression occurs, whose clearest constituents are pressure sensations of nervously pressing hands and heels together or of rigidly closing the lips.<sup>22</sup> In most cases, however, there is a rich flow of associated ideas (in visual, auditory, and kinaesthetic-verbal terms), of similar objects owned or recently experienced by the observer. Frequently there occurs also a specialised, self-set problem to choose the most appropriate association as a reaction.<sup>23</sup>

This choice may take place with or without conscious effort or search. Several, mostly unsuccessful attempts were made to name some part of the object.<sup>24</sup> The reaction is often anticipated in auditory terms, a few times in internal speech. Sometimes it is automatic. In some instances it is accompanied by a vaguely pleasant satisfaction or an unpleasant feeling of doubt or uncertainty. This leads then to verbal comment of self-criticism or justification of the reaction word.

This summary shows that the mid-period can easily be divided into two or three sub-periods, which we may call the stage of recognition, the stage of suppression, and the stage of search, suspense, or hesitation. This is followed by the after-period with its stage of reaction. In the case of ob-

<sup>20</sup> *Automobile—Steering-wheel*, 2.0 sec. "As soon as I saw picture visualized a red car I had seen recently. No name of object in consciousness. Visual image of the steering wheel came as part of the whole and esp. vivid as my eyes fixated that part of the picture, then reacted."

<sup>21</sup> *Electric fan—Breeze*, 2.2 sec. "Word 'electric fan' came in internal speech and almost said it, had some effort to suppress it by closing lips. Then word 'breeze' came automatically, perhaps because I had used it in previous introspection."

<sup>22</sup> See preceding introspection.

<sup>23</sup> *Automobile—Fast*, 2.5 sec. "Said 'automobile' in internal speech and tried to think of a manufacturer. Made effort to find one, pressing of thumbs and contraction of toes, was conscious of wasting time to find name of manufacturer, with a feeling of embarrassment. Finally the word 'fast' came automatically without choice and no internal speech with it. Also needed no effort of suppression."

<sup>24</sup> *Piano—Steinway*, 0.9 sec. "Said 'piano' in internal speech and 'Steinway' came at once because my piano at home and one here is Steinway. Had intended to describe part of picture, but cannot do it, either forget it or am unable to do it."

servers A, C, and D, the second and third stages gradually merge into each other, while with B the second stage drops out entirely, because this observer tended to neglect the negative aspect of the instruction and fell into the habit of always naming a part of the exposed picture (in accordance with the positive part of the instruction: "you may describe it or name any of its parts"). In his second article<sup>25</sup> Langfeld finds the same tendency occurring among his observers, so that he now omits the relevant passage in the instruction.

The first point of significance in our introspections is that the negative instruction does not inhibit the rise of the forbidden name into consciousness. There are only 43 cases out of 282 experiments, that is, about *fifteen per cent*, in which no name of the object occurred; and some of these are due to failure of recognition. The structural form in which the name appeared varies both in kind and in degree. In a few extreme instances real movements of articulation are made and the first letter is actually pronounced. More often, however, the articulatory movements are only initiated by bringing the vocal organs, as the palate, tongue, teeth and lips, into the right position for pronunciation. This requires usually a few very delicate movements, neither visible nor audible to another person, and an interruption of breathing, especially after inspiration, the "catching of one's breath," with its kinaesthetic-organic effects. This sort of experience is called by some observers "incipient pronunciation," by others a kinaesthetic "tendency" to pronounce the name. It shades off by degrees into "internal speech," where most of the kinaesthetic constituents have lost their sensory and assumed an imaginal character. This telescoping and abbreviating process makes it possible that internal speech usually involves more than one word, so that more or less complete grammatical sentences occur in it. The organic sensations are still present as a vague, unitary complex, although actual respiratory disturbances are rarely perceived by the observer himself. As soon as all kinaesthetic elements have given way to corresponding images and all organic remnants have dropped out, the name of the object is said to be a mere "verbal idea." Often auditory images of the sound of the word fuse with it, and the whole complex becomes rather vague and flashlike. Together with the visual perception and an occasional vaguely pleasant feeling of familiarity, it constitutes the recognition-stage. The observers experience no

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<sup>25</sup> Ibid., p. 411.

difficulty in detecting the presence of the forbidden name and in distinguishing between its various kinds and degrees of complexity. It is evident from the results that a successful suppression does not mean the prevention of the occurrence in consciousness of the forbidden name, or the breaking up of the associative tendencies between the perception and the verbal name of an object. It might be possible to reach this stage after many months of continuous practice; but even then the result would be due, not so much to the force of a negative instruction, as to the substitution of other associational habits, set up either by a positive element in the instruction or by a new special task which the observer intentionally assigns himself.

The failure of the negative instruction to keep the forbidden idea entirely out of consciousness is counterbalanced by the successful suppression of the motor discharge; that is, the inhibition of the reaction of articulation. This effect is brought about in two different ways, which may be called the *attitudinal* form of suppression and the *ideational* form of suppression. The former consists mainly of kinaesthetic strain and pressure sensations in the back of the mouth, by some called "tightness of the throat," and probably identical with the "locking of the muscles of the throat" mentioned in Langfeld's reports,<sup>26</sup> of general bodily tension and rigidity about the lips, and of inhibited breathing, especially immediately after inhalation. The strong pleasant feeling of relief often accompanying the reaction is due to a sudden, almost explosive loosening of this muscular tension. In the case of A the release of the throat-setting frequently resulted in reactions beginning either with a guttural sound, such as carriage, gas, Gordon, clock, etc., or with a sound due to the previous position of the speech-organs as locked after initiating the forbidden name, for example, drum-pipe, saw-hammer, ship-boat, etc. Similar instances occur also with other observers, as the introspection 21 with D seems to show. In the case of D the muscular tension due to suppression is usually more widespread. The following is an illustration of an extreme case: *Typewriter-Hamilton*. "On sight of picture said 'typewriter' in internal speech and tried to think of manufacturer of one. Was not conscious of suppression of 'typewriter.' Said 'Hamilton' but was not sure that it was the name of any when I said it. Am not sure now

<sup>26</sup> One of his observers writes: "active suppression by slight locking of the muscles of the throat," and another says: "suppressed it by closing the mouth and putting the tongue against the roof of the mouth."

concerning the suppression, *because remember the contraction of toes and striking the heels together and moved nose up*. Had no visual image of typewriter, but was conscious of intricate mechanism, have never seen one like this."

The ideational form of suppression consists chiefly in some verbal repetition of a part of the instruction, as "you are not to name the object," or in phrases like "wonder whether so and so is all right," "perhaps so and so might do," etc., or in the words of Langfeld's observers: "thought I should not say it," and the like. These ideas issue immediately in the stage of search, which in its briefest form is made up of eye-movements over the picture, restlessness, and further verbal ideas, all toned unpleasantly, until some particular idea or internal speech lends itself to a reaction-word which is finally pronounced. In this connection it is noteworthy that, if such ideas occur immediately upon the naming of the picture, the observers remark explicitly that no suppression was required, presumably because the idea of the name of the object is so intimately associated to the subsequent ideas as to lead at once to them. This is, for example, the case with such common-place associations as chair-table, etc. Here, then, as well as in the ideational form of suppression, the immediate motor discharge of the forbidden idea is directed into other ideational channels and thus delayed and changed; but the entire absence of an idea of instruction leads the observers to the statement that there had been no suppression. They thus imply that the idea of the instruction "must not say so and so" acts or functions as a suppression, or better inhibition, of the motor discharge, and conversely, that the attitude of suppression means the same thing as the idea "must not say it." Indeed, this fact of identity in meaning is explicitly mentioned by B, and there is no doubt in the writer's mind that, if the other observers had been asked whether there was any meaning in the attitudinal suppression-consciousness, they would have given the same answer. At least, the writer is clear in his own case; and the introspection on 'typewriter' by D, quoted above, can fairly be interpreted in the same way. Here the first statement of the absence of suppression is afterwards corrected because of the recollection of the attitude. From Langfeld's introspections several instances can be quoted that confirm this position; for example: *Comb-Hair*, ". . . locked the muscles of the throat after thinking that I must not say the word"; or *Sleigh-Ride*, ". . . thought I should not say it. Locked muscles and then said ride." It is true that these

two examples do not tell us how the observers 'thought' of the instruction, or in what processes its meaning was carried; but the word 'thought' suggests that they were indicating meaning rather than giving an analytical description.

From our own records, however, it is clear that the attitude of suppression means just as much "must not say so and so" as the ideational suppression. Meaning in the case of the attitude, then, is carried by an organic-kinaesthetic complex; the two are the same thing looked at from two different points of view, namely from that of logic and that of psychology. Perhaps the following analogy will help to an understanding of the difference of standpoint. Suppose that in a dog ready to bark a similar organic-kinaesthetic complex could be aroused at the critical moment by some sort of gesture made by his master, or by some other visual stimulus, and that it really should prevent the dog from barking. Should we be willing to attribute to the dog's consciousness the thought, "I must not bark?" We may be perfectly willing to admit that the dog has sensations and sensation-complexes similar to ours, but we should consider it absurd to assume that the dog's mind could interpret its experiences from such different points of view as those of logic and of psychology. Even the human mind still finds difficulty in recognising and separating the two standpoints. The difficulty is enhanced by our use of words and verbal ideas, because in this case the experience considered merely as a spoken or ideated word is so intimately interwoven with the meaning of the word that only the most subtle processes of abstraction can distinguish between the purely existential or psychological and the logical or rather teleological aspect of the same experience. The climax of this difficulty, however, occurs when the verbal idea has reached such a degree of degeneration, abbreviation, or condensation (these terms are not here intended as descriptive of the actual event) as to make its original sensory content, its elementary tissue, unrecognisable. At this stage the verbal ideas seem to be reduced to a single, unitary, qualitatively undifferentiable type, which has been designated 'imageless.' Unfortunately, the term 'imageless thought' seems to imply either that there are experiences which cannot be looked at from any other point of view than the logical, because these experiences or thoughts have no existence aside from their meaning, or else that these imageless thoughts have a structural character of their own which is neither sensory nor imaginal nor affective.

If the first implication is accepted, then psychology has nothing to do with these experiences; they lie outside the sphere of psychology; they present no psychological problem; they may obey logical laws, but they have no attributes of quality, intensity, duration, etc., corresponding to those of the processes of mind. If the second implication holds (and most of the American upholders of imageless thought seem to favor it), then introspection should be able to reveal the structural character, and language should find a positive name for it that is free from the reference to logical meaning and avoids the nondescript negative 'imageless.' So far the upholders of imageless thought have failed to give us an analytical description, which alone can entitle it to equal rank with the other mental elements. At any rate, our own introspective analyses of suppression clearly demonstrate that there is no new mental process added to the attitude in order to make it mean "must not say so and so."

All that is needed to bring out this meaning is a change from the psychological-descriptive to the logical-indicative point of view. The change is so easily made and in fact is so natural to an unpractised, uncritical observer that the confusion or mixture of *Kundgabe* with description is the rule rather than the exception. Our records furnish many illustrations, especially with C and D. Their earlier introspections are almost entirely *Kundgabe*; gradually more and more descriptive terms are introduced. A and B, on the other hand, begin with minute analyses, and later refer by general, indicative terms to complexes once analysed. Both kinds of report therefore need interpretation, but different kinds of interpretation. With A and B it is merely a matter of substituting complete formulae for short symbols, while with C and D a reconstruction is required, a translation of indicative into descriptive terms, which is rather dangerous as it tempts the interpreter to substitute his own analysis for the observer's words. For this reason the writer has presented the introspections in greater completeness than would have been otherwise necessary, and thus the reader can judge for himself in how far the dangers of interpretation have been avoided.

Apart from the relation of our introspections to meaning and imageless thought, they have established the fact that the suppression, whether as attitude or as idea of instruction, is successful in inhibiting the articulation of the forbidden name, but cannot prevent its appearance in consciousness in one form or another. The reason for this fact will be better

understood after we have considered the introspections on the fore-period, which are summarised and illustrated below.

### INTROSPECTIONS ON THE FORE-PERIOD.

*Observer A.* (35 experiments.)

While listening to the instruction and at the signal "Ready" there is a strong, staring fixation of the small screen where the picture is expected. At the same time such verbal ideas as "What will it be?" occur in the background of consciousness. At "Now" a slight organic excitement sets in with brief suspension of breathing. The speech-organs are now rigidly set for a quick reaction, and the body assumes a general strained position of readiness. Just before the screen is raised there is a flashlike verbal memory of the instruction in abbreviated internal speech, "you are not to name the object." With the first upward movement of the screen there comes a short, slightly pleasant relief from the strains of fixation, the eyes usually following the screen a short way before perceiving the picture. The signals are often followed by auditory after-images.<sup>27</sup>

In later experiments the fixation is less strict, the signals are barely noticed, while the strains of rigidity, frowning, etc., become less intense, and the respiratory irregularity gradually disappears. The instruction is still briefly repeated, but now between the two signals. Everything is much reduced in clearness and intensity.<sup>28</sup>

Finally, fixation is entirely given up. A vague, general kinaesthetic consciousness of the bodily position forms a passive, calm attitude of waiting. The organic elements and repetition of the instruction drop out.<sup>29</sup> The whole period has practically no focus of attention, save that occasionally some auditory element rises momentarily to slightly greater intensity and clearness.

*Observer B.* (36 experiments.)

At first the signal "Ready" sets up a widespread bodily reaction consisting of changed breathing, slight organic nausea, kinaesthetic strains, and fixation of small screen. There are also auditory-kinaesthetic verbal ideas or internal speech, such as: "wonder whether this will be fore-period or after-period," All this is unpleasantly toned. At "Now" the body becomes rigid and the throat is set for reaction. During this part there occurs sometimes a "vague awareness of the original instruction" or a "general awareness of what to do."<sup>30</sup>

<sup>27</sup> "Staring fixedly at screen. At 'Ready' heard stopwatch, and was vaguely conscious of some organic complex in connection with breathing. Do not remember hearing 'Now.' Just before raising of screen a vague, verbal memory-idea of instruction 'must not name picture.'"

<sup>28</sup> "Passive, calm attitude of waiting. Slight kinaesthetic strains of readiness. No special fixation. 'You are not to name the object' repeated in internal speech. Then 'Now' and stopwatch heard together, barely noticed."

<sup>29</sup> "Very passive, blank attitude of expectancy. Barely heard signals. Was vaguely conscious of bodily position. No focus of consciousness."

<sup>30</sup> "At 'Ready' fixated center of screen hard. Had vague visual image of some object there. Vague feeling of Aufgabe 'must not name.' Mild excitation with disturbed breathing and a little nausea. Slight strains in head. Rather unpleasant. Then 'Now,' felt body getting rigid, with eyes still fixated on spot."

In later experiments the excitement due to the uncertainty as to which period will have to be reported disappears. The "Ready" signal is now followed by an abbreviated repetition of the instruction in internal speech, and by a vague organic-kinaesthetic attitude with strains in the head and about the eyes, corresponding to the raising of the screen and slight inhibition of breathing. At "Now" there are a slightly increased tension of fixation and a vague realisation of what to do.<sup>81</sup>

Still later the repetition of the instruction becomes vaguer, more abbreviated and automatic.<sup>82</sup> Toward the end of the series it is sometimes entirely omitted. The bodily attitude is now one of calm, passive relaxation with the feeling of security, while fixation remains steady.<sup>83</sup>

*Observer C.* (46 experiments.)

At the signal "Ready" a strained, organic-kinaesthetic attitude of concentrated expectant attention is taken up and the small screen fixated. Then a part or the whole of the instruction is repeated either auditorily or in internal speech, sometimes interrupted by the signal "Now."<sup>84</sup> Often an auditory after-image of the signal occurs.

This state of consciousness gradually changes into a passive attitude of waiting, with a feeling of ease and fixation of the screen. The repetition of the instruction is now often omitted, and its place is sometimes taken by an automatic-verbal repetition of the signals.<sup>85</sup> In some cases the interval between the signals is described as a conscious blank with no mental processes in the focus of attention.

*Observer D.* (34 experiments.)

The reading of the instruction has become so tedious and unnecessary that it arouses a strong feeling of impatience, expressing itself in general bodily restlessness, pressing the hands together, drumming on the table, and in verbal comments, as "yes, I know that," "go ahead," etc., carried in auditory-kinaesthetic ideas or in internal speech.<sup>86</sup> The instruction is therefore hardly ever repeated by this observer. The signal "Ready" is interpreted as a question, frequently answered with

<sup>81</sup> "After 'Ready' vague awareness of *Aufgabe* in kinaesthetic and organic sensations. Bodily attitude of tension, strains in head, and inhibited breathing. Kinaesthetic strains in eyes corresponding to the expected raising of the screen."

<sup>82</sup> "Repeated automatically 'you are not to name the object.' Passive attitude, calmly waiting. Feeling of security that I should do the right thing."

<sup>83</sup> "Automatic repeating of word 'Ready.' Fixated the spot where picture would come, waited in relaxed state."

<sup>84</sup> "Strain sensations from sitting up straight in attitude of waiting. At 'Ready' and 'Now' concentrated attention on screen. In auditory terms 'do not name object.' Then saw screen rising."

<sup>85</sup> "Heard 'Ready' again as an auditory after-image. Then a conscious blank. Then 'Now,' and repeated it in auditory verbal terms, until the screen rose."

<sup>86</sup> "Rather impatient. Said 'yes' in internal speech and noticed peculiarity in experimenter's voice. Attitude of expectancy. Was conscious of the pause between 'Now' and rising of screen, with feeling of waiting."



"yes" in internal speech, or with an actual or a "mental nod."<sup>27</sup> This is accompanied by a general kinaesthetic attitude of readiness with strained, expectant attention, and fixation of the screen. The signal "Now" excites a mildly pleasant interest and occasionally gives rise to verbal ideas of comment on the length of the interval between signals, on the experimenter's voice, etc., until the screen is raised.<sup>28</sup>

Toward the end of the whole series verbal ideas seem to be the only prominent items left; everything else seems to drop out entirely or to recede so far into the background of consciousness as to be unnoticed.

In connection with these introspections it is important to recall the exact words of the instruction. "Shortly after you hear the word 'Now' a picture will be exposed in the square opening. You are to speak the first word suggested to you by the object in the picture, unless it is the name of this object. You are not to name the object, but you may describe it or name any of its parts. For example, if it is a cow, you may say small, old, head, etc. After the word is spoken you are to give the results of a careful introspection. Pay particular attention to the processes of suppression and association and to the imagery." It will be seen that this instruction involves four factors which refer to the future: (*a*) it calls for the first word suggested by the picture; (*b*) it requires the avoidance of the name of the object; (*c*) it suggests the use of descriptive terms or the naming of parts; and finally (*d*) it calls for introspections. In the light of Ach's work and the results of the Würzburg school we must assume that these four factors set up four different determining tendencies, which we shall designate as the *a*, *b*, *c*, and *d* tendencies. We need not now make any further assumptions as to their exact nature or their neural substrates, but refer the reader to Titchener's discussion<sup>29</sup> of these tendencies. The *a* tendency, if occurring in isolation from the others, will most naturally resolve itself in giving the name of the object, because under ordinary circumstances this would be the most frequent course of events. At any rate we can safely assume that the name of the picture occurs among those associated processes which are set in some sort of readiness by the *a* tendency. In the case of observers C and D this readi-

<sup>27</sup> "Feeling of impatience. Said 'hurry up' in internal speech. Drew breath and pressed hands together. Then fixated screen."

<sup>28</sup> "At 'Ready' feeling impatient at repetition of instruction. Said 'go ahead' in internal speech. Was conscious of shorter interval between 'Now' and stimulus. Mild interest. Kinaesthetic sensations from fixation of screen and vague general tension of body due to attentive attitude."

<sup>29</sup> Lectures on the Experimental Psychology of the Thought Processes, 1909, pp. 107, 111, 127f., 163, 174, 246f.

ness is sometimes so great as to cast a strong reflex light into the consciousness of the fore period; both observers mention the occurrence of vague ideas that might be used as reaction-words. From the previous discussion it will be remembered that the mid-period of the same two observers was often filled with visual and verbal associations aroused by the picture, and that in their case the attitudinal form of suppression was both less marked and less frequent. Conversely, we find in the fore-period of A and B an attitude remarkably resembling that of the suppression in the mid-period. There are the same organic excitement and irregularity of breathing, the same rigidity of the speech-organs, and the same sort of general bodily strains. The observers do not recognise the similarity at the time of experimentation; nevertheless we believe that these mental processes are a reflex light cast by the *b* tendency into the consciousness of the fore-period, similar to that thrown by the *a* tendency in the case of C and D.

The reasons why A and B should not recognise the similarity are not far to seek. In the first place, during the fore-period there is nothing to be suppressed, or in other words there is a different conscious context. In the mid-period the attitudinal processes occur in the presence of the picture and the idea of (or tendency to say) the forbidden name, while in the fore-period the same processes occur in connection with the sound of the signals, the verbal repetition of the instruction or at least of the signals, and the staring fixation of the small screen. The immediately following movement of the screen and the accompanying temporary relief interrupt these attitudinal processes. In the second place, the simultaneous verbal repetition of the instruction already carries the meaning "must not say it," so that the attitudinal processes in their new context may assume another meaning which prevents their recognition as a suppression. Their meaning during the fore-period may be summarised in the word: expectancy, in accordance with the interpretation explicitly or implicitly put on them in our introspective records.

Nevertheless it is significant that the working out of the *b* tendency as set up by the instruction is at least partially anticipated in the fore-period in both the forms in which it is later to be realised. This need not surprise us, because it lies in the nature of a determining tendency to prepare for future operation all those processes which have any connection with the idea of object, in our case with the idea of the forbidden name. Which of the two forms of suppression will actually occur in the mid-period depends, according to

our results, upon the degree to which the name of the object is present, as is shown in Table II.<sup>40</sup> The figures indicate the frequency with which a certain conscious structure of the forbidden name is suppressed in the ideational or in the attitudinal form or not at all; for example, B suppressed the internal speech of the name four times by the idea of instruction, seven times by the attitude, and twice not at all. In order to change these figures into percentages, add half their value for A, C, and D, and one-fourth for B. It will be seen at a glance that C and D had the largest number of no suppressions, because in their case the *a* and *c* tendencies supplied many associations from which to select a reaction-word. The table also shows that the kinaesthetic tendency and the actual initiation of articulation required in every case the attitudinal form of suppression, while the verbal idea of the name was suppressed merely by the idea of instruction; only when the name occurred in internal speech do we find sometimes the ideational and sometimes the attitudinal suppression.

In his second article<sup>41</sup> on negative instruction Langfeld reports introspections on the fore-period from which he draws

TABLE II. RELATION OF CONSCIOUS STRUCTURE OF FORBIDDEN NAME TO KIND OF SUPPRESSION

Kind of Suppr.	Obs.	Verbal Idea	Internal Speech	Kinaesth. Tendency	Initiated Articulation	No Name
Ideas	A	6	9	—	—	—
	B	13	4	—	—	—
	C	7	7	—	—	—
	D	6	3	—	—	—
	Total	32	23	—	—	—
Attit.	A	—	23	5	2	—
	B	—	7	12	2	—
	C	—	2	4	3	—
	D	—	13	3	—	—
	Total	—	45	24	7	—
No. Ss.	A	7	7	—	—	8
	B	25	2	—	—	15
	C	19	10	—	—	15
	D	18	16	1	2	5
	Total	69	35	1	2	43

<sup>40</sup> The data for this Table are furnished by the experiments of the first series.

<sup>41</sup> Ibid., p. 424.

the following conclusion: "Introspection on the fore-period showed no evidence of the necessity of translating negative into positive instruction. This makes it probable that there is a distinct negative as well as positive attitude, which in most instances can be described solely in terms of cortical set." Our results fully verify this statement, although we should hesitate to use the term "negative attitude," because it might give the misleading impression that the mental processes constituting this attitude can be either positive or negative. It is hardly necessary to point out that the logical meaning or purpose of the attitude may be either positive or negative, while its structural constituents, psychologically considered, can only be either present or absent. The concepts positive and negative are valid for logic, since they refer to the meaning and not to the existence of an experience. In the term "negative instruction" the adjective is not ambiguous because its reference to the meaning of the instruction is evident. In the case of the word attitude, however, the reference is doubtful, because this concept itself has only recently been introduced into psychology as a technical term, and because 'attitude' need not always have a logical meaning.

We can point out only in passing the gradual change in the fore-period due to the frequent repetition of the same situation. Our introspections illustrate in some detail the gradual progress of telescoping or abbreviating a rich or complex and highly organized or differentiated consciousness into a seemingly simple and unitary experience, such as is indicated by the term 'conscious blank.' Some of the original constituents drop out entirely, others become more fleeting and vaporous, some change from a sensational to an imaginal character, all lose in intensity, and the total consciousness falls to lower and lower levels of clearness, until in extreme cases no focal processes remain and we experience a one-level consciousness or the 'conscious blank.' The latter is a rare and extreme event in everyday life, because as a rule novel mental processes rush in and take the opportunity to rise to the focus of attention, that is, to the point of greatest clearness.

#### INTROSPECTIONS ON THE AFTER-PERIOD.

*Observer A.* (36 experiments.)

The reaction is sometimes accompanied by a more or less distinct and clear consciousness of the reactor's own voice in kinaesthetic, tactual, and auditory sensations. At other times the reaction is set off so automatically by the previous position of the speech-organs that the ob-

server does not know what he is going to say or that he is speaking. Usually the reaction is accompanied or immediately followed by a feeling of relief made up of decreased strains from fixation or eye-movements, from frowning, and from relaxation of rigidity of the body and the speech-organs, and of organic sensations from resumption of regular breathing, sometimes marked by a faint sigh. This consciousness is quite pleasantly toned.<sup>42</sup> As a rule it is followed by a rush of verbal ideas, especially in the abbreviated sentence-forms, which contain both the name of the picture and the reaction-word just given, as "the kite is in the sky." Often these verbal ideas are of the nature of critical comment on, or justification of, the reaction-word. Now and then the observer asks himself the question: "Why did I say so and so?" These verbal ideas together with an organic attitude of satisfaction constitute a vague reference to the instruction successfully carried out.<sup>43</sup> In a few instances memories of similar pictures, reaction-words, or situations terminate this period.

*Observer B. (37 experiments.)*

After the reaction a feeling of relief arises due to relaxed fixation, renewed "eye-movements, and change in bodily position or "settling back." Sometimes the reaction-word is automatically repeated in internal speech while the eyes move about. In some cases the reaction-word is different from that intended or anticipated in auditory-verbal ideas and surprises the observer.<sup>44</sup> In such cases the speech-organs are set off either by the fixation of a part of the picture or by some sort of kinaesthetic explosion, rather than by ideational processes. Many other auditory-kinaesthetic processes follow, some expressing wonder why such or such a word occurred, others justifying or criticising it. They are frequently accompanied by a vague feeling of satisfaction and hint at the fulfilled instruction in some indefinite, as yet unanalysed way.<sup>45</sup> Further internal speech and sometimes visual-kinaesthetic memories bring this period to a close.

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<sup>42</sup> *Bicycle—Air*, 4.6 sec. "Said 'air' with distinct kinaesthesia of my throat-movements. Did not know what word would come out when I commenced to talk. Felt a pleasant relief in making an ejaculatory sound. Then wondered in abbreviated internal speech why I said air, and further verbal ideas on length of reaction-time."

<sup>43</sup> *Ship—Sky*, 1.9 sec. "I had fixated upper part of picture and now named it automatically. Then eye-movements over the rest of the picture. A sort of vague comfortable attitude of agreement or acceptance, as if justifying my reaction."

<sup>44</sup> *Pear—Stem*, 1 sec. "At 'stem' eyes fixated it. Then auditory-kinaesthetic verbal idea 'you did not name the object.' Feeling of satisfaction that Aufgabe was fulfilled. Eyes began to move away from picture and strains of fixation relaxed."

<sup>45</sup> *Locomotive—Whistle, well, well!* 1.1 sec. "Word 'whistle' came out automatically. Had intended in internal speech to say 'wind.' Was very much surprised at my saying whistle. I had also an auditory image of words wind and smoke as I said whistle. Then realised what I said. Your kinaesthesia gets ahead of the intellect."

<sup>46</sup> *Church—Steeple*, 1.2 sec. "After saying 'steeple' a mild vague feeling of satisfaction that I had done this all right, and had gone through nicely. Attitude of relaxation and mild relief. No particular images."

*Observer C.* (43 experiments.)

The reaction is usually followed by a kinaesthetic feeling of relief due to the cessation of strains from straight, rigid bodily position and from fixation. Frequently the train of visual and verbal memories started during the mid-period lasts until after the reaction, enhanced by new visual, kinaesthetic, tactual, and auditory images suggested by the reaction-word.<sup>47</sup> Sometimes there is a vague feeling of satisfaction at having obeyed the instruction. Toward the end of the series the reaction-word is occasionally followed by a conscious blank with nothing but the feeling of relief in the background of consciousness.

*Observer D.* (29 experiments.)

The feeling of relief closely follows the reaction-word, is made up mostly of kinaesthetic sensations due to cessation of previous strains,<sup>48</sup> and is toned slightly pleasantly. The reaction-word itself arouses visual and verbal memories, and sometimes the feeling of satisfaction at having followed the instruction, especially in doubtful or difficult cases.<sup>49</sup> Toward the end of the series the reaction becomes more automatic and the whole period very poor in associational and other contents.<sup>50</sup>

Two significant results are to be derived from these introspections. The first point holds particularly with observers A and B and refers to those instances where the reaction-word is set off kinaesthetically by the locked position in which the speech-organs are found to be, as a result of the previous attitude of suppression. The introspections on the mid-period have shown how the *a* tendency set up by the instruction is prevented from working itself out into a motor reaction if it conflicts with the *b* tendency. As soon, however, as the *b* tendency has realised itself by suppressing the forbidden name, the *a* tendency seems to resume its work by bringing into consciousness other associations set in readiness during the fore-period, and thus it will finally lead to a reaction. Frequently it is aided by the *c* tendency, which may sometimes develop into a habit of naming automatically a part of the picture. In some cases, however, especially when the attitudinal suppression is particularly strong, the inhibitory effect of the *b* tendency seems to extend over all the

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<sup>47</sup> *Pear—Leaf*, 3 sec. "Visual image of pear from own tree at home. Kinaesthetic and gustatory sensations of eating one with feeling of grain in it, like goose-flesh."

<sup>48</sup> *Ball—Play*, 1 sec. "Feeling of relief at saying play. Relaxation due to cessation of kinaesthetic effort of mid-period."

<sup>49</sup> *Cow—Milk*, 1 sec. "Kinaesthetic sensations due to closing of eyes as if I had finished my task and deserved a rest. Sigh of relief. Then in internal speech critical analysis of picture, noticed hump on top of head which looks like a hat."

<sup>50</sup> *Pear—Eat*, 1.1 sec. "Pleasant feeling of satisfaction and certainty from kinaesthetic sensations in neck and head due to nod, meaning I had done the right thing."

processes prepared by the other two tendencies, and as a result no ideas rise into consciousness to start a reaction. Under these conditions all the nervous energy seems to become concentrated in the organs of articulation, where it finally accumulates force enough to break through the blockade, and thus to lead to some sort of random movements which finally shape themselves into the pronunciation of an actual reaction-word. The observers A, B, and C describe this state in the following ways, respectively: "made babbling and stumbling articulatory movements before word came"; "your kinaesthesia gets ahead of the intellect"; "groping for a reaction-word, stuttering and keyed up to speak." In the light of our introspections we feel tempted to read a similar occurrence into Langfeld's example *Collar-T-tie*. In our own instances the observers add that they are speaking before knowing what they are going to say, their reactions are forced, involuntary, or unintentional, that is, the word is not anticipated in any conscious form whatever. The beginning of the reaction-word itself seems to indicate that it results from the sudden release or explosion of the restrained speech-organs. The sudden muscular relaxation together with the rush of air from the resumed expiration produce vocal sounds which shape themselves into words, while their initial letters indicate where the suppression had been most intense. If, for example, the attitude of suppression involves the tight closing of the lips, the reaction is apt to begin with labials; if the palate is most involved, the guttural beginning is more liable to occur; if the tongue is pressed against the roof of the mouth or against the front teeth, the words may start with such letters as s, t, th, etc., as in Langfeld's *T-tie*.

The other significant fact brought out by the introspections on the after-period is the frequent occurrence of a pleasant feeling of satisfaction "that the instruction was carried out successfully," "that the reaction-word is all right," etc. This feeling is sometimes accompanied by a train of verbal ideas whose meaning is either a criticism or a justification of the reaction-word with reference to the instruction. In other words, the mental processes of the after-period are still under the influence of the determining tendencies set up by the instruction. Here, however, the influence seems to be mostly physiological, and the reflex light which it throws into the consciousness of the after-period is so dim and ill-defined that a more minute analysis or description under our conditions of experimentation is impossible.

In this connection it may not be out of place to attempt a reconstruction of the physiological or neural mechanism which seems to underlie the two forms of suppression and their resultant association-reactions. This hypothetical reconstruction is purposely couched in the most general terms, because we do not wish to commit ourselves to any histological theory of the nervous system. It seems plausible to assume at the outset that a determining tendency may be set up by an experience if the neural process serving as the substrate of that experience does not conduct all its energy along some definite path, whether intracortical or efferent, but radiates at least a part of its energy diffusely over a larger cortical region. This region is thus thrown into a general but low degree of excitation, sometimes called a "cortical set." We may perhaps think of the diffusion as a storing up of potential energy. Any future stimulus that excites some neural process within this region will find its way prepared, and will therefore require less neural energy to set the process into function. It may also be possible that occasionally the rest of the region contributes its potential energy to the excited process, and thereby enhances the latter's activity or helps it to discharge itself along some new definite neural path.

We assume now that in our experiments the listening to the complex instruction sets up not only one, but several such determining tendencies. The first or *a* tendency, to give the first word suggested by the picture, prepares a cortical set or constellation of neural processes any one of which would issue ultimately in an efferent current leading to the pronunciation of the realised idea. Among these potential neural processes is one corresponding to the name of the object expected. The second or *b* tendency, not to say the name, prepares a cortical constellation which in one respect agrees with the first, namely in as far as it also involves the neural substrate of the name. On the other hand, this *b* tendency, if realised in isolation from the others, would lead to a closing or tightening up of all the muscles involved in articulatory speech. The third or *c* tendency, to describe the object or to name one of its parts, likewise to some extent overlaps the first tendency. If we try to represent this relation by a spatial schema (without assuming, of course, that its cortical parallel is necessarily or mainly spatial) we might think of three circles *K*, *L*, and *M*, arranged so that *K* and *L* cover the same area *x*, while *K* and *M* have in common the area *y*. In the area *x* there occurs the neural process corresponding to the forbidden name. As soon as the stimulus occurs, the neural process common to the first and second tendency is excited, and the forbidden name rises into consciousness and starts two efferent currents, the one in accordance with the *a* tendency to issue in the pronunciation of the word, and the other in accordance with the *b* tendency to prevent articulatory movements. If the two nerve-currents started exactly simultaneously and were of equal strength, no movement of either kind could take place, and we should probably remain unconscious of any tendency to speak or to suppress speaking. We must expect, however, that such a perfect equilibrium, if at all possible, is very exceptional. According to our introspections the *a* tendency seems to have more or less of an advantage over the *b* tendency, at least at the very beginning, and thus it is able partly to realise itself before the *b* tendency becomes effective. While the latter is now spending its energy on the locking of the speech-muscles, the other cortical regions originally aroused by the *a* tendency come into play, probably stimulated by neural processes corresponding to the continuous sight of the picture and perhaps also aided by the *c* tendency, or conversely, until another



neural process has accumulated energy enough to issue in a new efferent current leading to a new reaction-word. Sometimes this second reaction seems for some reason to be delayed, while the energy of the *b* tendency is being used up, and finally can no longer restrain the articulatory muscles from moving. Under the guidance or modifying influence of the belated *a* or *c* tendency the random movements finally issue in the pronunciation of the new reaction-word.

In the case of ideational suppression the neural mechanism seems to be somewhat different. It will be remembered that here the forbidden name arises only either as verbal idea or in internal speech, and very frequently the observers mention explicitly the absence of any tendency to pronounce the word. We must assume, therefore, that the cortical substrate of the ideated name does not issue in an efferent nerve-path, but is conducted into other central nervous processes which as the substrates of the ideated instruction belong to the *b* tendency. From here the nervous energy seems to pass through other intracortical channels, perhaps back into other regions of the *a* tendency, helping the associated ideas suggested by the picture to realise themselves, until one of them can finally lead to a reaction. In order to explain the total absence of conscious suppression, which happened most frequently with observers C and D who reported instead a rich flow of associated ideas, we need only assume that the cortical substrate of the ideated name radiates its energy diffusely over the entire *b* region which is already in a low degree of excitation. The additional energy thus distributed is, however, not sufficient to raise any part of it above the limen of consciousness. In these instances the suppression, to speak with Langfeld, "can be described solely in terms of cortical set." Before leaving this topic we wish to emphasise again the fact that our discussion of the possible neural mechanism underlying the consciousness of suppression is only a hypothetical reconstruction which cannot in any way affect our experimental results.

The two series of experiments with objects were intended to reveal any psychological differences between the effects of a negative and a positive instruction. Objects were chosen for two reasons. In the first place, they introduced into the situation an element of novelty, which was to counteract the progress of abbreviation that in the case of the pictures had advanced so far as to defeat all attempts at further introspective analysis. In the second place, the visual recognition of objects and their subsequent naming are so frequent among our everyday mental events that they likewise are too much of a shorthand affair to promise results helpful to our purpose. Below are given summaries and examples of introspections on the total period, first with negative and then with positive instruction.

#### INTROSPECTIONS ON TOTAL PERIOD WITH NEGATIVE INSTRUCTION AND OBJECTS.

##### *Observer A.*

During the fore-period strong kinaesthetic strains in the raised arm and tensions in the wrist occur in the earlier experiments, while at the same time the auditory perceptions of the signals are very clear.

Breathing is regularly inhibited and arouses a strong organic complex. The eyes are closed and remain so until the experiment is over.

The tactual perceptions beginning the mid-period are very clear, accompanied sometimes by very faint visual images of the parts touched or of the whole object. Recognition always involves the name of the object, mostly in internal speech. Then follows a very complete attitude of suppression, similar in all respects to that experienced with the pictures. Verbal ideas associated with the object lead finally to articulation.<sup>60</sup>

The reaction is usually accompanied or followed by a strong feeling of relief due to decreased strains of frowning and of holding the breath. Sometimes a slight pleasant feeling of satisfaction takes place, made up of a mental nod and verbal ideas of self-justification.

*Observer B.*

At "Ready" strains in the forearm arise with incipient kinaesthetic sensations of lowering it. Then an unpleasant disturbance of breathing brings with it a faint nausea. At "Now" the lowering of the arm is at first strongly conscious, later it becomes very automatic and is barely noticed.

The object is grasped tightly, furnishing various cutaneous perceptions of its tactual qualities, such as hard, square, smooth, etc., with verbal ideas. Recognition takes place by definite visual imagery of similar objects, often in vivid colors, and the name occurs in auditory imagery and internal speech, without any tendency to pronounce it. Then a vague verbal idea of the positive part of the instruction flashes through consciousness. The hand moves over the object to isolate the parts, visualizing each until the name of one part occurs, usually as auditory image or internal speech, leading to the reaction. Sometimes the name occurs before the part is touched, or a name is rejected with incipient head-shaking and eye-winking.

After the reaction and the accompanying relief there occur many verbal ideas, usually of wonder whether the reaction will be understood as meant, with a clear visualization of the part named.<sup>61</sup> Sometimes a

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<sup>60</sup> *Cards—Game*, 2.5 sec. "Fore-period was a more passive waiting. 'Ready' was repeated in verbal idea and also as auditory after-image. Then the verbal idea; 'time between Ready and Now is long.' Finally heard 'Now' clearly. The first touch was very clear, but unsatisfactory, too near the palm. Had verbal ideas: 'smoothness, slipperiness.' Then 'cards' came in internal speech with faint visual memory-image of five-spot, followed by the usual attitude of suppression which finally released itself in 'game' with strong clearness of guttural beginning and an accompanying feeling of relief. Then verbal idea: 'that's a natural association.'"

<sup>61</sup> *Electric bulb—Glass*, 2.2 sec. "At 'Ready' incipient sensations of lowering arm and strain sensations in arm, ready to drop at next signal. Very vague idea of what I was to do. Darkness of closed eyelids, no visual imagery. At 'Now' I lowered arm somewhat automatically, expecting something high. Struck something cool, smooth, and nice, then felt sharp point. Named in kinaesthetic-auditory idea and had visual image of similar bulb. Verbal idea 'must not say that.' Felt over object. Then visual image lighted up as thought reflecting light, word 'light' came as auditory-kinaesthetic idea. Feeling of relief as I began to speak. Had been through quite a strain, with verbal idea 'quite a troublesome one.' Then I remembered that I must tell my story, so commenced."

prominent touch-quality is given as a reaction, and once a visual quality.

*Observer C.*

The signal "Ready" sets up an attitude of expectation, made up of kinaesthetic and cutaneous imagery of grasping and lifting something. With "Now" the instruction flashes into consciousness for a moment, while the arm-movement is very clear.

The first contact arouses sometimes a feeling of surprise or unfamiliarity and a recognition of various touch-qualities. Afterwards the whole object is recognised, especially as soon as a certain part of it is singled out by touch. Its visual image and its name appear, the latter usually in internal speech. It is suppressed by the idea: "must not say it." Further visual and verbal ideas arise.<sup>52</sup>

One of them leads to the reaction, accompanied by a vague feeling of relief due to the release of the object, with kinaesthetic and tactual sensations, the latter frequently arousing tactual after-images.

*Observer D.*

In the fore-period the auditory perception of the signals is very distinct. The interval between them is filled by an expectant attitude consisting of muscular strains in lower right arm. The eyes are always closed.

The cutaneous perceptions of the various touch-qualities are sometimes accompanied by a feeling of surprise at the size or shape of the object. The recognition of the whole object involves its visual image and the name in internal speech. But there is never any suppression required, as the object arouses at once further verbal ideas, while the hand is touching the various parts. Sometimes one or another of these verbal ideas is suppressed ideationally, because it had been used too frequently before as a reaction. There is deliberate choice of one of the many verbal ideas in accordance with a self-set task to say the most appropriate word.

The reaction is usually preceded by internal speech and followed by a slight feeling of relief or pleasant satisfaction. Visual memories and verbal comment conclude the after-period.<sup>53</sup>

<sup>52</sup> *Knife—Cut*, 1.6 sec. "At 'Ready' had sensations of warmth in palm and a sort of stiffness in arm. At 'Now' I had to think quickly what I should do. Then lowered hand, almost immediately recognised object, with visual and verbal image of knife. Repeated knife in internal speech and had trouble in finding a reaction-word. Then I happened to feel the blades and the word 'cut' appeared, first in internal speech, then said aloud."

<sup>53</sup> *Spool—Sew*, 1.2 sec. "After first signal I heard a slight sound and wondered what object it would be. Feeling of interest. Attitude of expectation in muscular sensations due to position of hand in readiness. Conscious of moving hand down. Immediately at touch the word 'spool' came in internal speech with auditory image, even before I had touched all parts. Then felt middle part to make sure and with it the word 'sew' came automatically. Said it with feeling of surety that it was all right. Verbal idea that reaction-time was shorter than usual."

## INTROSPECTIONS ON TOTAL PERIOD WITH POSITIVE INSTRUCTION AND OBJECTS.

*Observer A.*

The fore-period is quickly becoming automatic; its auditory and kinaesthetic contents are less and less clear, until practically no focus of attention remains, and a conscious blank results. The lowering of the arm is barely conscious.

The first touch-complex, however, is very clear, mixed with kinaesthesia from moving over the object. If any difficulty in recognition occurs, it is marked by frowning and a faint respiratory disturbance. Sometimes the part most touched arouses a very faint visual image. The recognition of the whole object involves in some cases kinaesthetic images of using the object. Then the verbal idea: "oh yes, it's so and so" occurs and leads at once to articulating the name.<sup>54</sup>

The speaking itself is often conscious as an auditory-kinaesthetic complex with a slight feeling of relief or satisfaction. This is followed by more verbal ideas commenting on the nature of the reaction with reference to the instruction. The tactual release of the object leads to a general attitude of relaxation. In the last experiments of this series the tactual perception of the object is followed at once by a slightly pleasant familiarity-feeling and the reaction.

*Observer B.*

The fore-period has become very automatic, consisting of vague auditory perceptions of the signals and kinaesthesia of position and movement of the arm.

The first contact is very clear and sometimes slightly surprising. It arouses a visual image of the object, usually at first only vague. While moving over the object the parts touched are visualized more clearly, sometimes in vivid and changing colors. Then the name occurs in auditory-kinaesthetic form, but is not said immediately. There intervenes sometimes a vague idea of the new instruction, and sometimes a period of hesitation or uncertainty. After a renewed contact, in order to make sure, the reaction finally takes place.

Frequently it is accompanied by verbal ideas of wonder whether the name was right or whether a better synonym should have been chosen, or similar self-justification and criticism. A feeling of kinaesthetic relief follows, and in a few cases visual memory-images arise.<sup>55</sup>

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<sup>54</sup>*Clamp—Clamp*, 1.6 sec. "Usual vague fore-period. Recognition of object consisted of pleasant feeling of familiarity, very faint visual image of the object, and clearer kinaesthetic imagery of opening clamp and hanging it on nail. Then came the verbal idea 'clamp' leading to articulation. As I said it had verbal idea: 'I ought to have said paper-clamp.' Then feeling of relaxation in hand and all over body, seemed to come after letting go the object."

<sup>55</sup>*Pencil—Pencil*, 1.9 sec. "Fore-period as usual, very automatic. Then I felt the object carefully, to be able to name the whole object. While touching it had vague visual image of light-grey pencil, which was most distinct where I grasped the object. Then word 'pencil' in auditory-kinaesthetic idea, but did not say it immediately. Was slightly conscious in terms of kinaesthesia in head that I must be sure of object before naming it, therefore hesitated. Had a vague memory of the time when I called a pen a pencil and did not want to make the same mistake. With saying 'pencil' the visual image of it became more distinct."

*Observer C.*

During the fore-period the instruction is repeated in internal speech, at least in abbreviated form. The arm is lowered automatically at "Now."

Then follow the touch-complexes of the parts successively touched, with recognition of the material, size, etc. As soon as a special part is felt the whole object is recognised and visualised. This leads immediately to the name of the object, at first in internal speech, then as reaction.

The latter is often very automatic and accompanied by visual imagery of similar objects. Tactual after-images occur after releasing the object.<sup>66</sup>

*Observer D.*

During the fore-period the instruction is repeated at first in internal speech and very completely. Later it becomes more abbreviated and finally is accepted with verbal idea: "yes, sir, I know that," etc. Afterwards it drops out entirely. The arm is lowered almost unconsciously.

The first cutaneous perceptions are very clear and sometimes named in verbal ideas. The recognition of the object occurs with a distinct visual image and the name in internal speech, which, however, is later omitted, so that the reaction occurs immediately. Sometimes wrong recognitions and wrong names occur first, but are inhibited until renewed touch and movements lead to the right name, which is usually due to the contact with a special part of the object.

The reaction is followed by slight feelings of certainty, doubt, etc., and sometimes by new visual and verbal memories.<sup>67</sup>

Before taking up the comparison of the negative with the positive instruction it is necessary to consider the changes introduced into consciousness by the use of objects instead of pictures. The only important difference seems to take place in the stage of recognition. The pictures used in our experiments are so small that the eye can take in the whole object at a single glance and recognise it immediately. The objects, however, are of different sizes, so that one grasp by the hand reveals as a rule only a part of the object. In the course of making several successive grasps, or of moving the fingers over the object, certain parts are sometimes recognised

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<sup>66</sup> *Rubber-stamp—Stamp*, 3.3 sec. "After 'Ready' repeated directions in internal speech. First contact was roughness of small disc. Feeling of unfamiliarity. Ran fingers over it until I came to handle. Recognised it at once, visual image of stamp with rubber-handle and nickel-plated rubber-holder. Then word 'stamp' was spoken automatically. Next I had visual image of stamped paper and several tactual after-images."

<sup>67</sup> *Nail-file—File*, 2.3 sec. "Fore-period as usual. Cutaneous perceptions of cold metal and pointed rough end. Grasped handle first and was uncertain until I touched file-part. Visual image of silver nail-file with steel end and dull point. Then a clear image of some design on the handle. Said 'file' automatically, without internal speech. Had feeling of certainty that I was correct."

and named independently in verbal ideas, before the whole object as such is known, as in the case of the handle of the screw-driver. Frequently the recognition of the object depends upon contact with a special part; thus, several observers recognised the electric bulb as soon as they touched its sharp point. In most cases the first few contacts furnish only isolated perceptions of touch-qualities, of form, size, weight, material, etc. The final recognition of the whole object is usually made up, asode from the cutaneous complexes, of clear visual images, often in vivid colors, of similar objects (except with A, who is a poor visualizer), of the name of the object in verbal idea or internal speech, and of a more or less pleasant feeling of familiarity. As in the case of the pictures the recognition is followed by the stages of suppression and of search (except with D, for the same reason as in the experiments with pictures), which in their mental structure are like the corresponding stages of the earlier experiments. There is likewise no important change in the fore and after period. It is evident, then, that the experiments with objects and negative instruction confirm in every way the results obtained with the visual stimuli.

In one respect this similarity is somewhat surprising. We must remember that the instruction calls for the first word suggested by the object. One should expect, then, that the very touch-perceptions would lead to immediate reactions. Instead, the observers in every case wait for the recognition of the whole object, which is not required or even suggested by the instruction, and which besides is unnecessary, as unrecognised pictures or objects ordinarily may lead to reactions. There seem to be two possible explanations. On the one hand, we may refer to the racial predisposition or instinctive *Einstellung* to cognise everything,<sup>58</sup> which may make itself more strongly felt in unusual situations where the sense of sight is excluded. If such a general racial predisposition exists, we must assume it also to function in the experiments with the pictures. Indeed, here it may superpose itself upon the particular tendency to name the pictures, and may thus give this *a* tendency the initial slight advantage which our introspections lead us to attribute to it. On the other hand, we have reason to believe that the *a* tendency, to name the first word suggested by the object, is far less strong than the *b* tendency, except with regard to the forbidden name which is set in neural readiness by both of them together, although

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<sup>58</sup> Titchener, *Lectures on Thought-Processes*, pp. 124 and 250.

perhaps more by the *b* tendency than by the *a* tendency. As long, therefore, as the tendency to suppress is stronger than any other tendency, the former must necessarily bring the forbidden name to consciousness. That is to say, the mental processes constituting the attitude or the idea of suppression, and meaning: "must not say it," presuppose the conscious existence of the experience to be suppressed, or in everyday language: we must know what to suppress, and we can neither know nor suppress it if it is not in consciousness. It may be true, as Freud's theory seems to maintain, that both act and object of suppression under certain abnormal conditions become unconscious, that is, function neurally only; but the present experiments furnish no evidence for this position, perhaps because the required abnormal conditions were not realised; neither did the writer, in his introspective analysis of the 'concealed complex,' find any support for it.<sup>59</sup> A comparison of the consciousness under negative instruction with the consciousness of the hidden complex is reserved for a future occasion. In the meanwhile the writer, who is at present unable to continue the study of these topics, may be permitted to suggest here the problems of analysing the consciousness of negative judgments and negative suggestions.

A glance at the introspections with positive instruction reveals at once the much greater poverty in mental contents and much quicker automatization of the whole consciousness. In the fore-period the new instruction is repeated a few times in the earlier experiments by C and D, never by A and B, although with B a verbal memory of it occurs occasionally in the mid-period, when recognition is difficult. In the case of A, B, and D, such difficulties are not rare and lead to an attitude of exaggerated caution in reacting, which shows itself in longer reaction-times. This result seems to be purely accidental, and is due to partly or totally unsuccessful recognitions. With C tactual recognition seems to be rather easy and quick, although even here a few difficult cases increase the range and mean variation of the reaction-times, while their average length, which otherwise would have been less, is thus made equal to that of the previous series. Aside from the accidental attitude of caution the mid-periods differ from those with negative instruction in the obvious absence of the

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<sup>59</sup> A preliminary Introspective Study of the Association-Reaction Consciousness. *Am. Jour. Psychol.*, XXI, 1910, 597-602.

stages of suppression and hesitation, while the after-periods of the two series are very much alike.

Following out our previous hypothesis, we must now assume that the positive instruction sets up a determining tendency to say the name of the object. Langfeld seems to think that it also sets up determining tendencies not to say anything else. He writes: "in all positive attitudes one can say that there is also a negative quality, inasmuch as the way is blocked for all associations not included in the instructions." Now the term 'negative quality' in this connection is ambiguous; and the statement seems to us to be based on logical argument rather than on psychological evidence. Logically, to be sure, any  $x$  implies a not- $x$ ; but the logical implication is valid whether it is ever experienced in an individual consciousness or not. As soon, however, as it is thus experienced,  $x$  and not- $x$  become at once psychological existences or mental processes. But the reverse need not necessarily be true, that is, the mere experience of  $x$  need not involve either the presence or the suppression, even the subconscious suppression, of the not- $x$ . Our new instruction: "do not react with anything except the name of the object" is as favorable to the formation of such a tendency to suppress other ideas as it can be made in combination with a positive instruction. Nevertheless our introspections do not furnish the slightest evidence of a conscious or unconscious blocking of undesired associations. They lead us, therefore, to the conclusion that the only difference in consciousness under a positive and under a negative instruction is the absence or presence of the stage of suppression in either of its two forms. They also seem to support the view that a simple positive instruction sets up only one determining tendency, in accordance with which certain mental processes are neurally prepared for easier and quicker entry into consciousness as soon as the proper stimulus occurs; while a negative instruction sets up at least two determining tendencies, which either bring about a more or less conscious conflict of two mutually exclusive motor reactions, as in the attitudinal form of suppression, or prevent their ideational representations from issuing in motor discharge, and thus allow another neurally prepared process to lead to a reaction, as occurs in the ideational form of suppression.

In conclusion the writer regrets that lack of time and library facilities prevent his discussion of the recent literature pertaining to this subject.